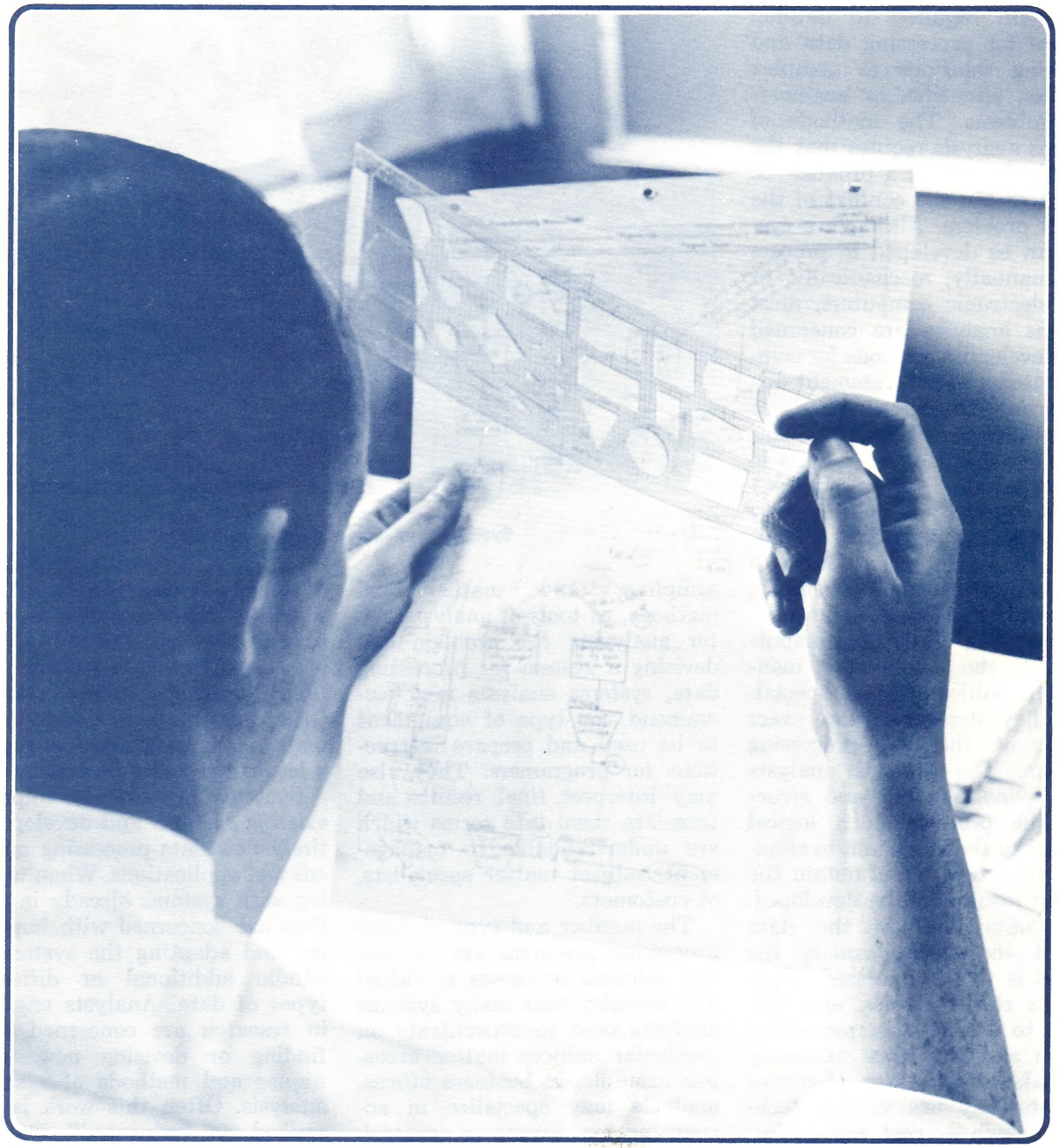
Employment Outlook

- Programmers
- Systems Analysts
- Electronic Computer Operating Personnel



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SYSTEMS ANALYSTS

(D.O.T. 033.187, 012.168, 020.081 and 020.088)

Nature of the Work

Systems analysts are concerned with the planning, scheduling, and coordination of activities which are required to develop systems for processing data and obtaining solutions to complex business, scientific, or engineering problems. The methods of systems analysis require that the individual parts of a problem be viewed within the context of the overall problem. Although a system can be developed to process data manually, mechanically, or with electronic computers, most systems analysts are concerned with developing methods for computer usage. (This statement discusses only the work of systems analysts who devise systems which use electronic computers to process data and solve problems.)

Systems analysts employed by large business firms may be engaged in developing methods to process accounting, inventory, sales, and other business information by using electronic computers. With the assistance of managers or subject matter specialists, they determine the exact nature of the data-processing problem. The systems analysts then define, analyze, and structure the problem in a logical manner so that a system to eliminate the problem and obtain the desired results can be developed. They obtain all of the data needed and define exactly the way it is to be processed. They prepare charts, tables, and diagrams to describe the processing system and the steps necessary to make it operate. Systems analysts may use various techniques, such as cost accounting, sampling, and mathematical methods, as tools of analysis. After analyzing the problem and devising a system for processing data, systems analysts may recommend the type of equipment to be used and prepare instructions for programers. They also may interpret final results and translate them into terms which are understandable to management, subject matter specialists, or customers.

Systems analyst reviews computer "run".

The number and type of data-processing problems are so vast and solution processes so varied and complex that many systems analysts tend to concentrate on particular subject matter areas. For example, in business offices, analysts may specialize in accounting or inventory control. Systems analysts who work for scientific or engineering organizations may specialize in problems such as determining the flight path of a space vehicle. Other analysts may develop systems for planning and forecasting sales or marketing research.

Systems analysts also improve existing systems and develop entirely new data-processing methods and applications. When working with systems already in use, they are concerned with improving and adapting the system to handle additional or different types of data. Analysts engaged in research are concerned with finding or devising new techniques and methods of systems analysis. Often this work is described as "advanced" systems

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design, and analysts engaged in this type of activity usually have mathematical, scientific, or engineering backgrounds.

Some systems analysts may have managerial and administrative duties. They are responsible for overall systems design and feasibility, and for assigning analysts to various phases of a project. They also may plan, organize, and control systems analysis throughout the organization in which they are employed and prepare reports of their work.

Places of Employment

About 150,000 persons were estimated to be employed as systems analysts in 1968. They work mainly for insurance companies, manufacturing concerns, banks, wholesale and retail businesses, and the Federal Government. A growing number of systems analysts are employed by universities and independent service organizations which furnish computer services to business firms and other organizations on a fee basis. Systems analysts work chiefly in large cities.

Training, Other Qualifications, and Advancement

There is no universally acceptable way of preparing for work in systems analysis. Some employers prefer that candidates have a bachelor's degree and experience in mathematics, science, engineering, accounting, or business. Other employers stress a graduate degree.

Educational preparation and experience often determine the kinds of job opportunities available to applicants. For example, employers are likely to seek a systems analyst who has a background in business administration to work in finance or similar systems areas; those having an engineering background are likely to be sought for engineering or scientifically oriented systems. Applicants also may qualify for work solely on the basis of professional experience obtained in scientific, technical, or managerial occupations, or practical experience in such data processing jobs as computer operator or programer.

Most employers prefer to hire people who have had some experience in computer programing. A young person can learn to use electronic data-processing equipment on the job or can take special courses offered by colleges, computer manufacturers, or their employers. In the Federal Government, for example, systems analysts usually begin their careers as programers. After gaining some experience, they may be promoted to systems analyst trainees so they may qualify as systems analysts.

In large electronic data-processing departments, a person who begins as a junior systems analyst may be promoted to a position of greater responsibility as he gains experience. Responsible positions in this field include those of senior or lead systems analyst. Systems analysts having proven leadership ability also can advance to positions as manager of systems analysis, electronic data-processing department manager, or other managerial positions.

Employment Outlook

Employment opportunities for systems analysts should be excellent through the 1970's. Systems analyst ranked among the fastest growing professional occupations in recent years. Employers have experenced difficulty in recruiting qualified systems analysts because of the demand for people with similar backgrounds especially from the science and mathematics fields.

A growing demand for systems analysts will result from the rapid expansion occurring in the number of electronic data-processing systems used by businesses, government agencies, and other organizations. Additional opportunities for systems analysts will arise as computers and peripheral equipment become more sophisticated and are made capable of solving more complex problems in a wider variety of fields. Greater emphasis will be placed on developing computer systems which will retrieve information more efficiently and economically; solve complex business, scientific, and engineering problems; and monitor and control industrial processes. These developments and others, such as the extension of computer technology to small businesses, the use of systems analysts in market research and in determining the locations of plants and stores, and the growth of computer centers to serve individual clients on a fee basis, signify a very rapid rise in future employment levels of systems analysts.

In addition to the many employment opportunities resulting from growth in the field, some openings will occur as systems analysts advance to more responsibility positions or leave their jobs to enter other types of emplyoyment. Because many of the workers are young, relatively few positions will be available because of retirement or death.

Earnings and Working Conditions

In 1968, beginning salaries of systems analysts averaged between $6,400 and $9,100 a year, according to a private survey

which covered more than 37,000 workers in business, government, and educational data-processing installations in all parts of the country. Earnings of experienced systems analysts averaged $12,000 annually, and in some cases they were paid $22,000 or more a year.

The great majority of systems analysts employed by the Federal Government in late 1968 earned from $8,462 to approximately $14,400 a year. Top salaries for experienced systems analysts ranged up to about $18,700 per year, although top managerial positions pay even higher salaries.

The workweek for systems analysts is usually the same—about 40 hours—as for other professional and office workers. Unlike many computer-oriented workers, such as console operators who work on two or three shifts, systems analysts usually work only during the day. Occasionally, evening or weekend work may be necessary to complete emergency or rush projects.

Sources of Additional Information

Additional information about the occupation of systems analyst may be obtained from the following sources:

American Federation of Information Processing Societies, 210 Summit Avenue, Montvale, N.J. 07645.

Data Processing Management Association, 505 Busse Highway, Park Ridge, Ill. 60068.

A list of reading materials on career opportunities in the data processing field may be obtained from:

Association for Computing Machinery, 1133 Avenue of the Americas, New York, N.Y. 10036.

PROGRAMERS

(D.O.T. 020.188)

Nature of the Work

An electronic computer, even though sometimes called a "mechanical brain" can only follow step-by-step instructions that tell it exactly what to do. The programer prepares these instructions.

A computer not only makes mathematical calculations at fantastic speeds, but stores large amounts of data in its "memory" and later uses it to perform its tasks, because computers are able to work with masses of information at tremendous speed and with a high degree of accuracy,

Computer programer consults flow diagram.

they are used for much "data processing" which would otherwise require the time of many employees. They handle varied assignments such as maintaining inventories, controlling production machinery in factories, making long-range weather forecasts, doing legal and medical research, and analyzing air traffic patterns.

Every "problem" processed in a computer first must be carefully analyzed so that exact and logical steps for its solution can be worked out. In some cases, the preliminary work is done by an experienced programer; in others, it may be done by a specialist known as a systems analyst. (See the statement on systems analysts elsewhere in the *Handbook*.)

Once this preliminary work has been completed, the "program," or detailed instructions for processing the data can be prepared by the programer. Exactly how he does this depends not only on the type of equipment to be used but on the nature of the problem. The mathematical calculations involved in billing a firm's customers, for example, are very different from those required in most kinds of scientific and technical work. The programing techniques are also different. Still other techniques are required in writing programing "aids" which reduce the amount of detail associated with programing. Because of these differences, many programers specialize in certain kinds of work.

In business offices, computers are frequently used to bill customers, make up payrolls, and keep track of inventories. Here the programer often starts his work by determining exactly what information must be used to prepare the necessary documents and by ascertaining the exact form in which this information is entered on company records. He then makes a flow chart, or diagram, showing the order in which the computer must perform each operation, and for each operation he prepares detailed instructions. These instructions, when they are relayed to the computer's control unit, instruct the machine exactly what to do with each piece of information, in order to produce each business document. The programer also is responsible for preparing an instruction sheet for the console operator to follow when the program is run on the computer. (The work of the console operator is described in the statement on Electronic Computer Operating Personnel.)

The final step in programing is "debugging"—that is, checking on whether the instructions have been correctly written and will produce the desired information. A program is usually debugged in two steps. First, the programer takes a sample of the data to be processed and reviews step by step exactly what will happen as the computer follows the series of instructions which make up the program. Then, after he has revised the instructions to take care of any difficulties that have appeared, he completes the test by having a trial run made in the computer. The console operator sometimes helps with this part of the debugging process.

A comparatively simple program can be made for a computer within a very few days. A program which deals with a complex problem or is designed to produce many different kinds of information may require a year or more of preparation—sometimes by a large number of programers. On involved problems, several programers at different levels of responsibility often work as a team, under the supervision of a senior programer.

The programer may perform other related duties, such as designing forms to use in data presentation. In addition, existing programs must be updated to keep pace with administrative changes or to improve efficiency. Also, the introduction of larger or newer model computers often requires that many programs be rewritten.

Places of Employment

About 175,000 programers were employed in 1968. In addition, some professional workers such as engineers, scientists, mathematicians, economists, and accountants spend a portion of their time programing.

Programers are employed chiefly by large business organizations and government agencies. A great many work for insurance companies and banks, public utilities, wholesale and retail establishments, and manufacturing firms of almost every kind. A considerable number are government employees doing work related either to scientific and technical problems, or to the processing of the vast amount of paperwork which is handled in many government offices. In addition, a growing number of programers are employed by computer manufacturers and independent service organizations which furnish computer and programing services to business firms and other organizations on a fee basis.

Training, Other Qualifications, and Advancement

The special abilities most sought after by employers when they hire programers are similar for all types of positions, but requirements regarding education and experience may be very different and may be dependent mainly on the problems with which the

programer will be occupied. Some programers are college graduates having degrees in engineering, for example, whereas others have had years of experience in work such as accounting or inventory control.

In selecting programers, employers look for people having an aptitude for logical thinking and the exacting kind of analysis which is part of the job. The work also calls for patience, persistence, and the ability to work with extreme accuracy. Ingenuity and imagination are particularly important in jobs where programers have to solve problems in new ways.

In organizations which use computers for science and engineering, most programers are college graduates, usually having degrees in engineering, the physical sciences, mathematics, or computer science. Graduate degrees may be required for some positions; for almost all positions, an applicant who has no college training is at a severe disadvantage.

Employers who use computers to process business records generally place somewhat less emphasis on technical college training. Many regard previous experience in machine tabulation, payroll work, or accounting equally as important and fill many of their programer positions by promoting qualified employees having such experience. When employers find it necessary to hire outsiders, however, they usually give preference to applicants having an education beyond high school. College courses in electronic data processing or in accounting, business administration, engineering, or mathematics provide especially good preparation.

Entrance requirements for jobs in the Federal Government are much the same as for those in private industry. Practically all entry programer positions in the Government require applicants to have a college degree, preferably with training in mathematics, or the equivalent of such preparation in previous work experience.

Young people interested in programing can acquire some of the necessary skills at a steadily increasing number of technical schools, colleges, and universities. The instruction available ranges from introductory home study and extension courses to advanced work in computer technology at the graduate level. High school courses in computer programing are also offered to students in many parts of the country.

However, high school and post-high school instruction do not entirely eliminate the need for on-the-job training. Since technological changes are continually taking place in this field and each type of computer has its own special programing requirements, some additional training is usually necessary.

Most beginners in this occupation attend training classes for a few weeks and then, as they work on minor programing assignments, continue with further specialized training. A year or more of experience is usually necessary before a programer can handle all aspects of his job without close supervision. Once he becomes skilled, his prospects for further advancement are good. Eperienced and capable programers are in strong demand. In organizations employing several programers, promotion may be to a senior programing job having supervisory responsibilities or to systems analyst. An increasing number of programers eventually move up to management positions in their firms.

Employment Outlook

Many thousands of new jobs for programers will become available each year through the 1970's. Employment is expected to increase very rapidly, as an expanding and increasingly complex economy causes computers to become more useful to business and government, and as the number of computer installations also rises rapidly. The increase in employment is expected to be particularly sharp in firms which use computers to process business records or to control manufacturing processes.

The rise in employment could well be accompanied by changes in the nature of the work done by programers. Advances in programing techniques and equipment, such as "automatic programing" and the use of programs and program parts stored in libraries for future reference, will eliminate much of the routine work associated with writing a program. As a consequence, professionally trained personnel qualified to handle both programming and systems analysis are likely to be increasingly in demand, especially for work on scientific and engineering problems. For other positions, many of them in large business offices where the analysis is done by accountants and other subject matter experts, there is some evidence that 2 years of intensive training at the post-high school level may provide a sufficient background for beginning programers.

Most of the openings for programers in the years just ahead will be new jobs that arise as the number of computer installations continues to increase, and computers are put to new uses. Some openings also will occur as programers advance to more responsible positions, or as they leave their jobs to enter other types of employment. Because this occupation includes many comparatively young workers, fewer positions are likely to become vacant

because of retirement or death than in other occupations of similar size.

Earnings and Working Conditions

In 1968, beginning salaries for programers averaged $7,850 a year, according to a private survey which covered more than 37,000 data processing workers in all parts of the country. Experienced programers averaged $10,600 a year, with some earning up to $17,000 annually. The average salary for programers having supervisory duties was $12,000 a year; some programing supervisors earned up to $22,000 annually.

The survey indicated substantial differences in the salaries of the lowest and highest paid individuals in the same kinds of positions, however, with some earning up to four times as much as others in the same group. These differences were due partly to the kind of data processed and the kind of computer used, as well as the industry involved and its location.

Federal Government salaries for programers are comparable with those in private industry. The great majority earn between $7,000 and $15,800 a year. The minimum entrance salary for beginners was $5,732 a year in late 1968, and the top salaries of experienced programers responsible for complex programing or supervisory and administrative work ranged to $19,800 or more a year.

The standard workweek for programers is about 40 hours. Unlike many computer console and auxiliary equipment operators who work on a 2- or 3-shift basis, programers usually work only during the day. Occasionally, evening or weekend worth may be necessary—for example, when it proves particularly difficult to debug a program.

Work places are usually modern offices, well-lighted and air conditioned. Employers recognize the desirability of providing the best possible work surroundings, because programers working under such conditions can concentrate more readily on the exacting kind of analysis which is an essential part of their job.

Sources of Additional Information

Additional general information about the occupation of programer may be obtained from:

Data Processing Management Association, 505 Busse Highway, Park Ridge, Ill. 60068.

American Federation of Information Processing Societies, 210 Summit Ave., Montvale, N.J. 07645.

A list of reading materials on career opportunities in programing may be obtained from:

Association for Computing Machinery, 1133 Avenue of the Americas, New York, N.Y. 10036.

ELECTRONIC COMPUTER OPERATING PERSONNEL

(D.O.T. 213.138, .382, .582, and .588 and 233.387)

Nature of the Work

Many specialized operators of mechanical equipment may be required whenever an electronic computer is used to process data. First, the computer's "input" must be prepared in a special code which enables the computer to process the data. Then, the computer console must be operated while the work is being done; finally, the computer's "output" must be translated back into words and numbers which can be read. The procedures employed in accomplishing this work vary from one computer system to another; often they are more involved and more difficult to learn than the operation of the equipment itself. The number and kinds of employees needed also vary for different computer installations. A small system—and some computers are no bigger than an office desk—may be operated entirely by one or two employees. A large system, on the otherhand, usually requires several workers, each of whom is assigned a specific task.

A computer's input consists of the data to be processed and the step-by-step instructions prepared by programers which tell the machine how to do the work. (Information about the occupation of Programer is given elsewhere in the *Handbook.*) In many computer systems, the input consists of punched cards prepared by *keypunch operators* (DO.T. 213.582) or of paper tapes prepared by *data typists* (D.O.T. 213.588). Less frequently, input may be prepared by operators of adding or bookkeeping machines having special attachments which perforate tapes. The work of these machine operators is similar to that performed by those who use the same general type of equipment for other purposes. (For additional information on these occupations, see statements on Typists, Office Machine Operators, and Bookkeeping Workers in this chapter.)

In some computer systems, punched cards or paper tapes can be used directly to feed information into the central computer. In other systems, small computers or terminals, linked to the central computer by telephone lines, supply the information. The fastest computer systems, however,

Computer technicians and auxiliary equipment operators work in teams.

get their input from a variety of "direct access" devices featuring magnetic surfaces on which data are recorded by means of spots. Input devices of this type include magnetic tapes, discs, data cells, and data drums. These computer systems include auxiliary equipment which records data directly on magnetic surfaces or transfers it from punched cards or paper tapes to the magnetic surface.

In some systems, this data transfer work is done by small computers. Other machines, used for the same purpose, are called converters and are run by *card-to-tape converter operators.* (D.O.T. 213.382.) Converter operators may be required to wire a fairly simple plugboard, and they must know how to interpret signals from a panel of lights on the machine. They also should have sufficient understanding of the whole computer system to recognize any errors that may have occurred in preparing input or to identify other situations which could prevent the system from operating properly.

Once the facts and figures to be processed have been converted into the form used by the computer, the data are ready for the "run"—that is, for processing in the computer. Operating the computer is the responsibility of the *console operator* (D.O.T. 213.-382), or computer operator, as he is sometimes called. The console operator first examines the programer's instruction sheet for the run and ascertains the procedure to be followed. He then readies the equipment, makes sure the computer is loaded with the tape, discs, or cards needed, and starts the run. As he operates the console during the run, he may have dozens of switches to manipulate and lights to observe. If the computer stops running or its lights signal an error, he must try to locate the source of the trouble.

Before a computer's output can be read, it must be translated from machine language to words and numbers. In some systems, this is done by machines directly connected to the computer and run by the console operator or his assistant. In many large systems, however, this work is done on converters, highspeed printers, and other machines run by auxiliary equipment operators—*tape-to-card converter operators* (D.O.T. 213.382), *high speed printer operators* (D.O.T. 213.-382), and others. Like operators of other kinds of auxiliary equipment, these operators may have to wire plugboards and watch for machine lights which signify errors. Some types of auxiliary equipment are relatively difficult to operate and, when computer systems include such equipment, operators sometimes specialize on one kind of machine. Many operators, however, run all kinds of auxiliary equipment used in a computer system.

The tape, discs, or cards used in processing data on a computer are stored after the run and are often used again and again—as, for example, in making up a payroll at the end of every pay period. A *tape librarian* (D.O.T. 223.387) or a console operator or *auxiliary equipment operator* may be responsible for storing tapes and making them available when they are needed again. The use of telephone lines for transmission of data to and from computers has expanded the range of tasks an auxiliary equipment operator is required to perform. Many operators run communications as well as computing equipment.

Many electronic computers are operated for as long as 16 to 24 hours a day. In such cases, they may be operated by two or three different shifts of workers. Usually, all operators work under the general direction of a chief supervisor, and employees on each shift work under the direct supervision of the console operator on that shift.

Places of Employment

The number of console and auxiliary equipment operators employed in 1968 is estimated at roughly 175,000. Jobs for operating personnel are found chiefly in government agencies and in insurance companies, banks, wholesale and retail businesses, transportation and public utility companies, and manufacturing firms. Many operators also are employed in independent service organizations which process data for other firms on a fee basis.

Training, Other Qualifications, and Advancement

When installing electronic computers, employers often fill as many of their new operator positions as possible by transferring employees from other types of jobs. Such transfers are frequently from jobs as operators of the tabulating and bookkeeping machines which may no longer be needed after the computer is installed. Many computer operators also are recruited from outside the firm.

In hiring outsiders, private employers usually require at least a high school education. For console operator positions, some college training may be preferred. In the Federal Government, applicants for auxiliary equipment operator jobs must be high school graduates, unless they have had specialized training or previous experience in some related work. Console operators employed by the Federal Government generally are required to have a high school education and some work experience. They also may qualify for appointment on the basis of previous experience in computer work and a general aptitude for it, as demonstrated by special tests. Many private employers also screen applicants for operating positions by giving them tests designed to measure their aptitude for the work, especially their ability to reason logically.

Beginners hired for work of this kind or transferred to it from other positions in their firms, are seldom expected to have had specific training as operators. Most employers provide the necessary training after the worker is hired. The training of auxiliary equipment operators may require a few weeks, that of console operators somewhat longer. Console operators usually attend classes where they learn how to mount tapes and operate the console. They must become sufficiently familiar with the equipment they are using to be able to trace the causes of mechanical failures. This training is supplemented by further instruction on the job.

As they gain experience, operating personnel may be assigned to operate more complex pieces of equipment. Eventually they may be promoted to supervisory positions or jobs which combine some supervisory duties with console operation. Console operators may acquire sufficient understanding of programing through on-the-job experience to qualify for work as programers.

Employment Outlook

A growing and increasingly complex economy is expected to cause the use of electronic data-processing equipment to continue to increase very rapidly through the 1970's. Computers are being adapted to new uses almost daily, and, as the tasks they perform become even more varied, many more business firms will be utilizing them. Although the size of the staff required to operate a computer installation may be reduced somewhat as new types of equipment are developed, the total number of computer and auxiliary equipment operators is expected to increase very rapidly.

Thousands of operators will be needed to fill new jobs, both in firms having their own computer installations and in service centers which rent computer time to businessmen. Many operators also will be needed to replace operators of computer systems who transfer to other kinds of work or stop working. As in the past, employers will fill some positions by training people already in their employ, but many others will be filled by hiring outsiders.

The equipment changes which are expected in computers also may produce changes in job requirements for console and auxiliary equipment operators. Because of advances in technology, much of the equipment in use today is far less complex to operate than the first computers of the early 1950's; and future changes may bring further simplification. As a consequence, newcomers to this field may find it easier to qualify for the openings available than have applicants in the past.

Earnings and Working Conditions

Information about the salaries of computer operating personnel is available from a nationwide private survey conducted in 1968. The average salary for beginning console operators was $116 a week. Experienced console operators averaged up to $154 a week. The weekly salary of experienced keypunch operators averaged $105. The difference between the salary of the lowest and highest paid employees in each of the job classifications surveyed was much greater than these figures suggest, however. For example, the highest salary reported for a skilled console operator was $288 a week—more than three times the lowest salary reported for a comparable job. Many variations of this kind were due to differences in salary levels in various parts of the country and among individual companies and industries ; to some extent, they also were due to differences in the complexity of the work performed by operators having the same job titles.

Salaries of computer personnel in the Federal Government are roughly comparable with those in private industry. In late 1968, beginning console operators started at about $100 a week and auxiliary equipment

operators at about $82 a week. The maximum salary paid to experienced console operators in the Federal Government was about $210 a week; a few in supervisory positions may earn up to $325 a week, usually after several years of experience. Skilled auxiliary equipment operators earned up to $145 a week after several years of experience.

Operators of electronic computer systems generally work the same number of weekly hours and are allowed the same holidays, vacations, and other benefits as most office employees. Since many computers are operated on a two- or three-shift basis, scheduled hours for some console and auxiliary equipment operators include late evening or nightwork. Tape librarians usually work only when day shifts are on duty. (See introduction to this chapter for additional information on Working Conditions.)

Sources of Additional Information

Information on careers in electronic data processing may be obtained from:

A list of reading materials giving information about computer operating personnel may be obtained from:

Data Processing Management Association, 505 Busse Highway, Park Ridge, Ill. 60068.

Association for Computing Machinery, 1133 Avenue of the Americas, New York, N.Y. 10036.

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Bulletin No.		Price (cents)
1650–72	Construction Laborers and Hod Carriers	15
1650–73	Electricians (Construction)	15
1650–74	Elevator Constructors, Structural, Ornamental-, and Reinforcing-Iron Workers, Riggers, Machine Movers	15
1650–75	Floor Covering Installers.	15
1650–76	Operating Engineers (Construction)	15
1650–77	Plumbers and Pipefitters	15
1650–78	Roofers, Sheet-Metal Workers	15
	Mechanics and Repairmen	
1650–79	Automobile Service Occupations	20
1650–80	Air-Conditioning, Refrigeration, and Heating Mechanics	10
1650–81	Appliance Servicemen	10
1650–82	Bowling-Pin-Machine Mechanics	10
1650–83	Business Machine Servicemen	15
1650–84	Diesel Mechanics, Farm Equipment Mechanics.	10
1650–85	Electric Sign Servicemen	10
1650–86	Maintenance Electricians, Industrial Machinery Repairmen, Millwrights	15
1650–87	Instrument Repairmen	10
1650–88	Jewelers and Jewelry Repairmen, Watch Repairmen	15
1650–89	Television and Radio Service Technicians	10
1650–90	Vending Machine Mechanics	10
	Other Manual Occupations	
1650–91	Blacksmiths	10
1650–92	Boilermaking Occupations	10
1650–93	Dispensing Opticians, Optical Mechanics	10
1650–94	Driving Occupations Over-the-road Truckdrivers, Local Truckdrivers, Routemen, Intercity Busdrivers, Local Transit Busdrivers, Taxi Drivers	20
1650–95	Factory Operatives Assemblers, Electroplaters, Inspectors, Power Truck Operators, Production Painters	15
1650–96	Foremen	10
1650–97	Furniture Upholsterers	10
1650–98	Machining Occupations	15
1650–99	Meat Cutters	10
1650–100	Motion Picture Projectionists	10
1650–101	Printing Occupations	20
1650–102	Shoe Repairmen	10
1650–103	Stationary Engineers, Stationary Firemen (Boiler)	10
1650–104	Waste Water Treatment Plant Operators	10
1650–105	Welders, Oxygen and Arc Cutters	10
	SOME MAJOR INDUSTRIES AND THEIR OCCUPATIONS	
1650–106	Agriculture Cooperative Extension Service Workers, Soil Scientists, Soil Conservationists, Other Professional Workers, Farm Service Jobs	20
1650–107	Petroleum and Natural Gas Production and Processing, Petroleum Refining	15
1650–108	Aircraft, Missile, and Spacecraft Manufacturing	15
1650–109	Aluminum Industry	15
1650–110	Apparel Industry	15
1650–111	Atomic Energy Field	15
1650–112	Electronics Manufacturing	15
1650–113	Industrial Chemical Industry	15
1650–114	Iron and Steel Industry	15
1650–115	Motor Vehicle and Equipment Manufacturing	15
1650–116	Paper and Allied Products Industries	15
1650–117	Civil Aviation	20
1650–118	Electric Power Industry	15
1650–119	Merchant Marine Occupations Licensed Merchant Marine Officers, Unlicensed Merchant Seamen	15
1650–120	Radio and Television Broadcasting Radio and Television Announcers, Broadcast Technicians	15
1650–121	Railroads	20
1650–122	Telephone Industry	15
1650–123	Restaurants	10
1650–124	Banking Bank Clerks, Tellers, Bank Officers	15
1650–125	Insurance Business	10
1650–126	Hotels	15
1650–127	Government (Except Post Office) Federal Civilian Employment, State and Local Governments, Armed Forces	15
1650–128	Post Office Occupations Mail Carriers, Postal Clerks	15

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